

Central Virginia Governor's School
Senior Seminar Course
2011- 2012

Instructors: Dr. Lindeman, Dr. Smith, Dr. Jones, Mr. Douglass and Mr. Howard

Course Description

The Senior Seminar Tech Lab course provides students with the opportunity to continue developing their individual research skills, to learn more about current topics in science and mathematics, and to use sophisticated technology that is part of the modern research setting. Students pursue topics on an individual basis and in small groups. Students are also encouraged to develop an individual research project to be presented to the Virginia Junior Academy of Science and to enter in the Siemens and Intel Science Talent Search Competition or in the local/regional science fair.

Course Objectives

Students will:

- Develop research skills by pursuing an individual project under the guidance of a faculty member or by participating in one of the ongoing Governor's School research programs.
- Develop laboratory skills needed to operate sophisticated technology by utilizing the equipment available in the Governor's School's technology laboratories.
- Develop communication skills by preparing literature reviews, lab reports and research reports.
- Explore current topics in science, mathematics and technology by reviewing current literature (including internet sites) and visiting local industries.
- Develop time management skills for working in team situations and for planning and completing designated tasks.

Technology Laboratories

The Governor's School provides numerous opportunities for students to learn how to use sophisticated laboratory and computer equipment. Students rotate through the laboratories during the last five six-week periods of the school year. Students review the relevant current literature, learn terminology, theory, and applications related to the laboratory, demonstrate competence in using the laboratory equipment, and complete a project. Instructors provide guidelines for the exploration of each laboratory. Lab assignments are posted at the beginning of each 6-week grading period.

<i>Physical Sciences</i>	<i>Max. No. Students/La</i>
High-Speed Photography	8
Holography	6
<i>Computer Applications</i>	
Desktop Publishing (DTP)	8
Video Production	6
Robotics	6
Geographic Information System (GIS)	6
Wireless Technology	6
<i>Life Sciences</i>	
Electron Microscope	8
General Microbiology (5 th , 6 th 6-weeks)	8
Biotechnology (2 nd , 3 rd , 4 th 6-weeks)	8
<i>Senior Research Project</i>	?

Laboratory Safety

Students are expected to read the laboratory safety rules for the tech lab they are working in and to sign a lab safety agreement form that says they have read the safety rules and agree to follow the safety precautions and proper procedures at all times.

Caring for the Equipment

The equipment in the technology laboratories is research grade, sophisticated, and expensive. Students using this equipment need to acquire the proper skills to operate it effectively. Students must follow the guidelines of their instructors in learning how to use the equipment, demonstrate proper use of the equipment before using it independently, and use the equipment only under the supervision of an instructor. *Never perform any operation unless you know exactly what you are doing.* If you are not sure of what to do, ask your instructor. It will save damage to you, the equipment, and your pocketbook.

The technology labs provide the Governor's School students with the opportunity to explore sophisticated technologies, a privilege not available in regular high school programs. The laboratories represent a substantial monetary investment by the participating school divisions. All students need to care for the equipment in the laboratories to ensure that future students will have the same opportunities that you enjoy.

Grading

The instructors provide an outline of competencies, reading assignments, etc. for each laboratory. Student evaluation for a 6-week period is based on the following requirements:

1. Write literature reviews for two relevant articles from scientific journals or technical resources.
2. Take a quiz covering the terminology relating to the laboratory, as well as the theory and applications of the technologies used in the laboratory.
3. Complete skill checks for necessary skills to use specialized laboratory equipment.
4. Complete a project utilizing the equipment in the laboratory.
5. Complete session and weekly activity reports for each session.

At the beginning of each Friday session, each individual or group plans its activities filling out the session activity report. At the end of the session, the report is reviewed, making any changes or comments. The week activity report is completed with details concerning what each group member plans to do during the week on the project. Then the report is posted in the designated area. The session/weekly activity reports are used for individual assessment of students in skill checks and the project.

Attendance

Students must sign in and out on an attendance sheet each Friday. Since most of the work is hands on activities, attendance and being on time are extremely important factors in determining success. Students are allowed *one tardy* per six weeks. One point is deducted from a student's final six-week grade for each tardy beyond the first one. *Please note that your Senior Tech Seminar (which meets MWTh) is considered part of the Senior Seminar Tech Lab course. Tardiness to Senior Tech Seminar (MWTh) will result in deductions from the student's Senior Seminar Tech Lab course grade.*

Students must make up any work missed during an absence. Any work due the day the student was absent is due the next day the student returns to school, unless prior arrangements have been made. Long-term projects are still due as scheduled. *Work turned in more than one week late will not be graded.*

Proper Use of Senior Tech Seminar Lab Time

Students are given the freedom and opportunity to work on projects or assignments of their choosing in many different locations in the CVGS building during their assigned Senior Tech Seminar time. This time should be used for working on Senior Seminar or other CVGS course projects and assignments, getting help or advice from staff members or other CVGS students, or, if time permits, working on other academic assignments. Improper use of Senior Tech Seminar time includes, but is not limited to, such activities as playing computer games, watching TV, sleeping, and too much socializing.

One point will be deducted from a student's Senior Seminar six-week grade each time a student is reprimanded for improper use of Senior Tech Seminar time. Staff members will confront the student at the time indicating that they are not making proper use of assigned Senior Tech Seminar time. The staff member will then direct the student to a designated area where he/she can be supervised and guided in proper use of Senior Tech Seminar time.

Students with any six-week course grades below a B must report to the designated area where he/she can be supervised and guided in proper use of Senior Tech Seminar time until six-weeks grades improve.

Senior Research Projects

In Senior Seminar a student may elect to work on an independent research project. Depending on the nature of the project students may take Senior Research Project for one or two six weeks during the first semester. Each student is responsible for negotiating an evaluation plan with his/her mentor for each six weeks. Students are required to submit a final research paper to VJAS or other approved refereed scientific meeting or publication. Students are encouraged to enter their projects in the Siemens Competition (www.siemens-foundation.org), Intel Science Talent Search Competition (<http://www.societyforscience.org/sts/index.asp>), and in local/regional science fairs. Another option is to complete a project for the Young Epidemiology Scholars (YES) competition (www.collegeboard.com/yes).

Honor Code

Students are required to pledge all work according to the CVGS Honor Code found in the CVGS Student Handbook. Assignments without the signed pledge will be returned to the student not graded. The student can then pledge the work and resubmit it as late work. Any submitted work violating the CVGS Honor Code will receive zero credit.

Revised 8/9/11

2011 – 2012 CVGS Senior Seminar Descriptions of the Technology Laboratories

Desktop Publishing Laboratory

Students explore the realm of electronic page layout and produce documents using a desktop publishing system consisting of a computer, laser printer, scanner and software.

Video Production

The availability of low cost camcorders, video editing software and YouTube allows anyone to generate videos for family, fun, education, politics, business, etc. Video production is an ubiquitous part of our global society. Students can explore the world of Video Production using Apple iMovie and Final Cut Express, Flip and Canon video cameras and iMac computers.

Scanning Electron Microscopy Laboratory

Students have the opportunity to explore the basic concepts and techniques associated with studying the ultra structure of biological specimens using the CVGS Hitachi N3400 scanning electron microscope. Digital technology is used to produce prints from specimen micrographs. Student specimen micrographs are digitally captured and archived on the SEM web server. Students produce digitally enhanced inkjet prints of the images.

Holography Laboratory

Students learn the fundamental principles of holography, the techniques required to produce various types of holograms and applications of holography in areas such as structural stress analysis and optical data storage.

High-Speed Photography Laboratory

Students learn how to digitally capture images and use Photoshop to produce master images of objects or phenomena that occur at high speeds – things that the human eye normally cannot see. They use electronic sound, light, or contact triggers to trip electronic flash units that freeze the action, or they may use strobe photography for analyzing phenomena over a longer period of time.

Microbiology / Biotechnology Laboratory

In the biotechnology lab, students learn research protocols for culturing microorganisms and isolating DNA, RNA and proteins. Techniques for DNA extraction, restriction analysis, PCR and transformations will be explored. Microbiology labs include analysis of water, food and microorganism characteristics while learning the proper safety techniques.

Robotics Laboratory

Students investigate the fundamentals of robotics technology and program a Rhino Robot XR-3 Arm to operate in a work cell environment and create special task robots using LOGO Mindstorm sets.

Geographic Information System (GIS/GPS)

Students investigate the fundamentals of a GIS and how to link information to geographical places on a map. Students will use ArcView to view and create their own GIS.

Wireless Technology Lab

Students will explore wireless technologies by exploring how infra-red remote controls work. Students will use the remote controls to control a “Boe-Bot” which they have programmed to receive instructions from the remotes.

Revised 8/9/2011